



PROCEEDINGS  
OF THE  
PACIFIC COAST ENTOMOLOGICAL SOCIETY

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ONE HUNDREDTH MEETING

The one hundredth meeting of the Society was held on Saturday evening, August 29, 1925, in Room 10, of the State Department of Agriculture, Ferry Building, San Francisco, California.

President Van Dyke in the chair. Minutes of the two preceding meetings were read and approved.

Sixteen members were present, as follows: E. C. Van Dyke, F. E. Blaisdell, Sr., Grant Wallace, H. H. Keiffer, Eric Walther, J. O. Martin, A. O. Larson, E. P. Van Duzee, Mrs. F. E. Blaisdell, E. O. Essig, Charles L. Fox, U. S. Grant, IV; F. J. Spruyt, George R. Wilson, Lawrence Bruner and Ralph H. Smith.

Nine guests signed the visitors' book: Mrs. Emily Peek, Mrs. Grant Wallace, J. Aug. Kusche, E. L. Kessel, L. M. Smith, Miss Carol M. Howe, Mr. H. R. Jennings, Mrs. H. R. Jennings, and H. Najjar.

After reading of the Treasurer's report, President Van Dyke asked Doctor Blaisdell to report on the finances of the Pan-Pacific Entomologist. He stated that renewal of subscriptions were coming in very slowly and that there was \$59.50 in the treasury. Mr. Van Duzee stated that 137 subscribers to Volume 1 had not yet renewed their subscription for Volume 2. That circular letters were being sent out to them and to new addresses. He concluded by saying that he hoped the members would aid in getting new subscribers wherever possible.

Doctor Van Dyke then remarked on the past summer's work of several of the members and said that reports were in order. He then called upon Mr. Keiffer who was on the California Academy of Sciences Expedition to the Revillagigedo Islands, Mexico, in 1925. He reported as follows:

"Through the courtesy of the United States Navy Department the minesweeper 'Ortolan' was loaned to the California Academy of Sciences for a two months' cruise, with the Revillagigedo Islands as the main object of scientific exploration.

The islands in question are from three to five hundred miles southwest of the cape of Lower California (Cape San Lucas). They are of volcanic origin and comprise three main land masses and a rock.

The Ortolan left San Diego on April 18 with a staff from the

Academy representing all departments, and three Mexicans, the latter being present by invitation.

Guadalupe Island was our first stop. It is a long high mass of volcanic rock, surrounded on all sides by steep cliffs of black basalt, often over a thousand feet high. The northern end has a stand of pines and cypress with some oaks. Goats are everywhere in evidence. An attempt was made by four members of the party to gain the top and spend the night, but the rough nature of the country made traveling slow and night came before we were half way up. After spending a sleepless night in the rocks of a ravine we returned to the landing and were picked up the following afternoon.

Collecting was poor though a certain Tenebrionid was common and a number of specimens of a *Calosoma* were taken.

Our course was then south, passing the Alijos Rocks on April 24 and reaching Clarion Island, the most westerly of the Revilla Gigedos, on April 26. This island is apparently the oldest of the group, of volcanic origin, six miles long, half as wide and a little over a thousand feet high. It is thickly covered with brush of various composites, Euphorbias and Cactus. In some places a low tree occurs. The flora and fauna have a strong resemblance to those of the continental Sonoran region.

Insects were not hard to secure though the place was dry. Ground collecting yielded a small Tenebrionid in great numbers, a Carabid and a large cricket. The plants were inhabited by several types of Hemiptera, Hymenoptera and a small jumping Chrysomelid. A big black carpenter bee was very common and a *Polistes* wasp was everywhere. Three butterflies were taken, notably one species of *Papilio*, which is apparently identical with our *Papilio philenor* L. Light-collecting at night brought out many moths and other insects.

Our stay was terminated on May 1, when we proceeded eastward, passing Roca Partida on May 2 and arriving at Socorro Island on the evening of the same day. Socorro is the largest of the group, two hundred miles east of Clarion and three hundred miles southwest of Cape San Lucas. It is a magnificent cone, rising over three thousand feet from the water. Volcanic activity here is apparently recent, although at present only a few steam vents remain at the top. The flora of the lower slopes is mainly of a straggling shrub, averaging about five feet high and very wiry, making progress through it difficult. A few fig trees occur among this brush. At higher elevations is a beautiful forest of a variety of trees, some quite large. There is a much more tropical appearance here than on Clarion.

Collecting on the lower levels was poor at best. Only one species of ground beetle was found in quantity. Sweeping on grass and shrubs was also without much return. A large grasshopper occurs here but is difficult to capture.



At higher levels more forms were found on the leaves but ground-collecting proved to be even less profitable than lower. Several species of moths and flies were taken.

At Grayson's Cove, where the only fresh water known to occur on the island is found, a giant *Euphorbia* grows. Under its bark several types of beetles were taken, notable two species of Cerambycids.

On May 12 we worked over San Benedicto Island, a small pile of basalt and ash about thirty miles north of Socorro. It is covered with grass and grasshoppers but aside from that little was taken.

Continuing our journey we arrived at Maria Madre, the largest of the Tres Marias Islands on May 14. These islands are sixty miles off the Mexican coast and about two hundred miles southeast of Cape San Lucas. They are of sedimentary rock under which is granite. The flora is of the Mexican lowland type. Through the courtesy of the prison officials we were allowed to occupy the largest house in the village for our ten days' stay.

The time of year was unfavorable for insect-collecting, due to the fact that the dry season was on. All of the deciduous trees were quite bare of leaves. Bark-collecting was good, however, and at night many insects came to the light. A trip to Magdalena Island, the middle member of the group, showed the conditions there to be the same.

Our next stop was Isabella Island, May 24. This is a small volcanic island, between the Tres Marias and the mainland. Dryness prevailed at this place also, but many specimens were taken, notably some water insects. In a pool of water so saturated with salt that crystallization was going on, these insects lived in great numbers, though the mud at the bottom was so warm as to be uncomfortable to the hands. They were a species of *Hydrophilid* beetle, a *Corixid* or water boatman and the maggots of an *Ephydrid* fly.

After three days at Mazatlan we proceeded to Lower California where we touched at Cape San Lucas, Magdalena Bay, Turtle Bay, Cedros Island and San Quintin. In some places, notably Turtle Bay, the country was very dry, but a number of forms were taken, especially on Cedros Island, where the springs influenced the nature of the fauna and flora very much.

Our last collecting place was San Martin Island. The morning of June 8 was spent there and then we proceeded to San Diego, which was reached on June 9. A wide variety of conditions were covered during the trip, ranging from tropical to temperate. As a result many different species were taken, though the number remains to be worked out; the individuals numbered over ten thousand."

Mr. Fox followed with an interesting report on a collecting trip, principally for Hymenoptera, during the months of July and August, to eastern Washington, visiting Colfax, Pullman and

Wawawai; then into Idaho to Moscow and Lewiston. Later he made his way up to Metaline Falls on the Pend d'Oreille River, thirteen miles from the Canadian border. Finding collecting poor at this point, he went to Mt. Hood, Oregon, staying at Cloud Cap Inn, 6000 feet elevation, before returning to San Francisco.

His own words may be given as follows: "Just before arriving at Colfax, my first stopping place, prospect of good collecting did not look promising as the surrounding country, seen from the train, consisted of nothing but vast undulating dry wheat fields. However, on reaching Colfax and Pullman, I found that these towns were situated in valleys alongside small creeks, where, owing to the dryness of the surrounding country, bees and wasps were abundantly concentrated on such flowers as golden rod (*Solidago serotina*, *Epilobium angustifolium* and *Gaillardia aristata*. In this region, including Moscow, Idaho (elevation 2500 ft.), I took many species (not yet determined) which I had not seen in California and other parts of the Pacific Coast. I spent ten very successful collecting days on the banks and beaches of the Snake River at Lewiston and Wawawai. Here I found most of the Hymenoptera different to those in the Colfax-Pullman-Moscow district, including what will probably turn out to be eastern species that have worked their way through the north end of the Rocky Mountains in Canada, spreading gradually southwards. The following flowers, growing by this river, seemed very attractive to insects: dogbane (*Apocynum cannabinum*), golden aster (*Chrysopsis*), *Astragalus*, *Polygonum muhlenbergii*, golden rod (*Solidago serotina*), pennyroyal (*Monardella*), *Salix argophylla*, *Gaillardia aristata*, an introduced sweet clover (*Melilotis alba*), and the common willow, much of which was in bloom near the water's edge.

During my trip I took many specimens of two groups in which I am especially interested, namely, the small parasitic bees of the genus *Nomada*, and the Bembicine wasps. These latter I have determined as follows: *Steniolia duplicata* Provancher and *albicantia* Parker; *Stictiella tuberculata* Fox, and *emarginata* Cresson; *Bicyrtes mesillensis* Cockerell, *ventralis* Say and *parata* Provancher; *Bembix amæna* Handlirsch and *comata* Parker, as well as *Microbembix monodonta* Say."

Doctor Van Dyke then took the floor and spoke as follows, using for his topic his summer trip: "The first two weeks of this was spent in the wet belt of western Oregon, in company with Mr. E. P. Van Duzee, later four days were taken for attending the meetings of the Pacific Coast Entomological Society and the Pacific Slope Branch of the American Association of Economic Entomologists which were held at Reed College, Portland, in connection with the general meeting of the Pacific Division of the American Association for the Advancement of Science, and two weeks more was spent in collecting on Mt. Hood, Oregon and Mt. Adams, Washington. The places visited in western Oregon were



Corvallis, the slopes of the coastal mountains west of Corvallis, Newport, Waldport and Olney near Astoria. During much of the time the weather was poor, either raining or overcast, so that but few insects were on the wing. As a result most of the work had to be done with ground forms. The best collecting at Waldport and Newport was found along the seacoast where a number of very desirable species, such as *Cicindela bellissima* Leng, *Nebria diversa* Lec. and *Platycerus thoracicus* Casey were taken.

"*Nebria diversa* was abundant in places, under the driftwood beyond the normal high tideline. The *Platycerus* was found under old logs on the sand dunes. This species is interesting in that it has fully adapted itself to an existence in the sand dunes, being the most specialized of the entire genus for digging purposes. It is quite robust, hairy beneath, as is the case of many sand-dwelling beetles and provided with powerful fossorial legs. The sexes are also less differentiated than in any of the other species. Other Coleoptera of interest that were taken on this part of the trip were, a specimen of *Scaphinotus behrensi* Roesch, captured by Mr. Van Duzee; several *Zacotus matthewsi* Lec., taken by myself, and a number of *Platycerus laticollis* Casey, numerous *Otiorhynchinae* and so forth, captured by both. Much of this trip was made possible through the courtesy of the members of the entomological staff of the Oregon Agricultural College at Corvallis who acted as hosts and piloted us about the country in their automobiles.

"On Mt. Hood, I used the Homestead Inn, situated at about the 3000 ft. level, as my headquarters. Here I collected a goodly series of bees in the clover fields as well as many desirable Coleoptera by beating the trees and shrubs. It was, however, on the longer trips taken up the mountain toward Cloudcap Inn, somewhat near 5000 ft. in altitude and at snowline during June that the best results were secured. On the first of these trips I was accompanied by Mr. Merton C. Lane, and a glorious trip it was, for it was the first hot day of the season and the insects had come out with a rush. In the clearing made for a new mountain road, the Elateridæ and Cerambycidæ were flying about like flies. The most interesting Coleoptera taken on Mt. Hood were a number of *Zacotus matthewsi* Lec., *Nebria kincaidi* Schwarz, as well as many other forms of Carabidæ, many good species of Elateridæ, *Trachykele nimbose* Fall ovipositing in the blazes made in the firs to mark the trails, or wandering over the fire-scorched surface of the firs about old road camps, and *Anthophilax tenebrosa* Lec., which were flying about the old dead firs and hemlocks. On the Mt. Adams trip I was the guest of Mr. Lane. After spending a couple of days with Mr. Lane at his home in Toppinsh, Washington, which were utilized in looking over his collection, a trip was made westward by automobile through the Yakima Indian Reservation to the eastern flanks of Mt. Adams where several days were spent in collecting. The most important find here was a blind

Carabid of a new species and genus, somewhat related to *Pterostichus*. After this a swing around the mountain along the Mt. Adams Highway to the western slope of the mountain was made and a camp site selected high up near the timber line. From this, numerous trips were made, chiefly to and above snow line. Quite a series of *Amphizoa insolens* Lec. was secured from among the rocks along the margins of a glacial stream, in water so cold that it caused one's arms to ache. More *Zacotus* as well as other Carabidæ were captured beneath old logs, some few Cicindelidæ netted and a series of miscellaneous Coleoptera and other insects swept from the foliage.

"One of the most interesting facts which these trips brought to my attention was that the high mountains in this part of the country each have a more or less distinctive fauna. The fauna of Mt. Hood shows a very close relationship to that of the Sierra Nevada of California; that of Mt. Adams, across the Columbia River and somewhat farther north, a much closer resemblance to that of Mt. Rainier and the mountains farther north as well as to the mountains of Idaho; while that of Mt. Jefferson seems to bear a closer relationship to the Vancouverian forest fauna, such as is characteristic of western Washington and Oregon. All three of course have many species in common, but each has its distinctive forms. In the genus *Chrysobothris*, for instance, *C. pseudotsugae* Van Dyke breeds in the firs on Mt. Hood as it does near Lake Tahoe, California. On Mt. Adams, it is replaced by *C. carinipennis* Lec., a characteristic species of the northern Rockies and Great Basin, while the related *C. sylvania* Fall, a coastal species, is to be found on Mt. Jefferson. This peculiarity is also shown as regards the species of *Dichelonyx* which are to be found on the peaks, as well as many of the weevils."

Mr. Van Duzee, being called upon, stated that he had accompanied Doctor Van Dyke in the wet belt of western Oregon and also attended the meetings of the Pacific Coast Entomological Society, as did Doctor Van Dyke, at Reed College, Portland, Oregon. He related facts of interest noted in collecting on the trip. He told also of the results of the Academy's Expedition to the Revillagigedo Islands.

Professor Bruner spoke of the entomologists he had worked with and of the progress of entomology during the past sixty years, as well as of his collecting in Nebraska.

Mr. Martin related his experiences during his summer's collecting in Humboldt County, California, where the cold and rain interfered with his work.

Doctor Blaisdell stated that with his family and other friends he had taken an automobile trip to Oregon, Washington and Vancouver Island and that no attempt had been made to collect. On the return trip he had visited Mt. Rainier and did considerable collecting during one day. Took a number of interesting beetles,



especially *Nebria*, Elaters and Byrrhids, and numbers of *Okanagana cruentifera* Uhler at Yreka, California. He stated that his attention was first attracted to an object that fell from a tree in an oak grove under which he was camped. On going and examining the object found it to be a cicada. While examining it another object fell from an oak under which he was standing, that was also another cicada. On walking around under the oaks dozens of these insects were found, dead or dying. The trunks of the trees and grass were covered with dried pupal skins; the roadway and ground were riddled with holes where the pupae had emerged. Next morning as soon as the sun came up hundreds of cicadas were drumming in the trees and every now and then one would fall to the ground. Both sexes were among the specimens picked up. After returning home a number of tachinid flies were found in the box with the dried specimens.

There being no more to report, the meeting adjourned for social discussion until time for dispersion.

F. E. BLAISDELL, Secretary.

## ONE HUNDREDTH AND FIRST MEETING

A special or one hundredth and first meeting of the Society was called for Tuesday evening, October 20, 1925, to entertain two visiting entomologists from British Columbia, namely, Dr. J. M. Swaine of Ottawa, Assistant Entomologist in charge of Forest Insect Investigations and Ralph Hopping, Forest Entomologist of Vernon, Canada.

The following seventeen members and friends were in attendance: E. C. Van Dyke, E. P. Van Duzee, E. O. Essig, George Wilson, Charles L. Fox, J. F. Killeen, Louise Rupe-Killeen, Grant Wallace, Mrs. Grant Wallace, F. E. Blaisdell, Sr., Mrs. F. E. Blaisdell, Mrs. Ralph Hopping, L. B. Soliman, Dudley Moulton, H. H. Keiffer, Miss Helen Sanford and William F. Breeze.

The meeting was opened by President Van Dyke with a few appropriate remarks, after which Doctor Swaine was asked to tell of the work being done in the Dominion of Canada on Forest Insect Investigations. His talk was very interesting and instructive.

Doctor Swaine was followed by Mr. Hopping, who told of his work and the conditions of the forests in his field of investigation.

President Van Dyke then called upon Professor Essig to tell of the latest developments in Economic Entomology in the United States. Considerable discussion then took place between the speakers. After other members had made short talks, the formality of the meeting was set aside and social discussion followed until time for adjournment.

F. E. BLAISDELL, Secretary.



## ONE HUNDREDTH AND SECOND MEETING

The one hundredth and second meeting of the Society was held on Saturday evening, December 12, 1925, in Room 10, State Agricultural Department, Ferry Building, San Francisco.

President Van Dyke in the chair. Minutes of the preceding meeting were read and approved.

The following members responded to roll call, eleven in all: E. C. Van Dyke, Charles L. Fox, James E. Cottle, E. P. Van Duzee, Dudley Moulton, George R. Wilson, Fred C. Brosius, H. H. Keiffer, J. O. Martin, J. F. Killeen and F. E. Blaisdell, Sr.

A single guest was present, namely: John F. Curry.

There being no business to transact, Mr. Cottle was called upon for remarks. He responded with a talk on certain species of butterflies, namely, *Melitaea* and *Satyrus* and their aberrations. He mentioned especially *Melitaea quino* Behr, *verna* and female *eremita* Wright; *Cercyonis Gabbi* Edw. and *stephensi* Wright. Specimens of the several phases were exhibited.

Doctor Blaisdell stated that a *Melitaea* collected by him at Poway, San Diego County, was identified as *M. cooperi* and that the food plant was a woody perennial shrub with a knotty woody root. The flower was of the labiate type and canary yellow in color; leaf small and slightly elongate oval in shape.

Mr. Fox exhibited a small collection of Bembicine wasps taken by Doctor Van Dyke during his summer's outing. Of one species, *Steniolia tibialis*, a melanic male was collected by the Doctor in Meadow Valley, Plumas County, other typical specimens were taken at an elevation of 3500-4000 feet on June 21, 1924.

Mr. Van Duzee called attention to the fact that scarabaeid larvae were doing damage to the lawns in San Francisco. Specimens of the larvae were reared to maturity and proved to be those of *Hoplia pubicollis* Lec. Doctor Blaisdell said that he had found them in his lawn on Lake Street.

Doctor Van Dyke then read the following paper dealing with the Secondary Sexual Characters of the Coleoptera:

The secondary sexual characters of the Coleoptera are, I believe, the most numerous and most diverse of any order of insects. They have long merited the attention of the systematist and have also attracted the biologist, but these have in the main dealt with them individually. Collectively, they are also most interesting as well as instructive. Because of this I have felt that it would be worth while to assemble and discuss them as a whole.

These characters may be defined as being those peculiarities of structure which are distinctive of the individual sexes yet are not a part of the sexual organs themselves. They may or may not be of value for sexual purposes, that is, as far as we can judge. In most cases, however, they are of undoubted value to the possessor. In many groups they are quite stable, being found throughout the group or the greater part of it, and are more or less of the same

type. In others they are quite plastic, being found only occasionally and then are of diverse type. As much as they bear a close relationship to certain activities of the insect, they can be discussed most readily under definite headings as the six which I have selected.

I. *Characters chiefly of value in enabling the sexes to find each other.*

Under this category should, of course, be placed first the special senses and as, in most insects, the sense of smell is probably the most important we shall commence with that. The antennæ of the Coleoptera are as a result well developed and much specialized. The simplest type of sexual modification is through the greater elongation of these in the male and this is well shown in the majority of the Cerambycidae and Anthribidae, many Cucujidae, Elateridae, Ptinidae, Meloidae and Cantharinae, as well as some few Buprestidae and other families of beetles. Often, as in some species of the first two families, the male antennæ are twice as long as are those of the female. A more complex type is one where appendages or filaments are attached to the outer segments of the male antennæ, giving them a plumose appearance in contrast to the simple or serrate antennæ of the female. In the males of some Cantharidae like *Phengodes* and *Zarhipis*, these plumose antennæ are especially well developed and this is somewhat of a surprise here as their eyes are also quite large and their mates not only the most larviform of our Coleoptera but luminous as well. One would suppose that their very well-developed eyes would be sufficient. Perhaps the answer to this is that they depend upon the eyes mainly at night when the female is abroad and luminous and upon the antennæ during the daytime. I have often captured male *Zarhipis* in full flight during the heat of the day. The plumose type of antennæ is also found among the males of most of the Pyrochroidae, Rhipiceridae and Rhipiphoridae as well as many of the Elateridae and some Cerambycidae, Meloidae, Bruchidae and Ptinidae, a few *Pedilus*, one Buprestid, *Xenorhipis brendeli* Lec., and so forth. All of the beetles with long and plumose antennæ live mainly in the open where their delicate organs are not so liable to injury. In such as burrow to a great extent, they must be shorter so that they can be tucked away at times. In certain of these, like the Lucanidae and Scarabaeidae, the males, though having rather short antennæ, often have the outer joints greatly expanded so as to form wonderfully developed pectinate or lamellate structures. In those where these are the most highly developed, like *Polyphylla* and *Plecoma*, they vie with the Saturnid moths in degree of perfection. As might be expected, their mates are very sluggish, in the case of *Plecoma* the female being wingless and rarely emerging from her retreat within the earth. In most of the Coleoptera with clavicorn antennæ, including the Scolytidae, we find that there is but little difference between the sexes as to the



degree of development of these organs. The explanation is, no doubt, that they find their mates when they find their food and the need for this is as great in one sex as in the other. The same reasoning might also apply to the predaceous groups of beetles, such as the Carabidæ and Dytiscidæ whose filiform antennæ differ but little between the sexes. In some of the Carabidæ the outer joints of the palpi are greatly developed in the males as in the Cychrini. These may supplement the antennæ.

The sense of sight is, perhaps, second to the sense of smell in the Coleoptera so the eyes should be next mentioned. In many of the nocturnal Elateridæ, Scarabæidæ and Cerambycidæ, some of the males have larger eyes than the females. This is also the case with most of the Cantharidæ, especially those where the females are luminous. Strange to say where both sexes are luminous and fully winged there is but little difference in size, though they are usually well developed, but not so large as in those species of which the males alone are winged like *Microphotus*. In the species where both sexes fly, they no doubt assemble through the aid of the light and then find their mates, and the same thing, no doubt, holds true with the genus *Pyrophorus* among the Elateridæ, perhaps the most intense light producers in the insect world, for the eyes, though well developed, are of about equal size in the two sexes.

The wings also rank as important in bringing the sexes together. In most Coleoptera, both sexes are either provided with equally well developed wings or are both wingless, but here and there among families whose members usually fly well we find cases where one sex or the other cannot fly. The commonest cases are where the males have retained the wings and the females have them greatly reduced or have lost them entirely. This has, no doubt, come about as a result of the great increase in size of the females due probably to the necessity for greater egg production, with a resulting sluggishness and alar atrophy through lack of use. Degeneration or retardation of development having once set in, it has progressed until females have been evolved which are not only wingless but larviform in structure. The best known cases where the males are fully winged and the females wingless are to be found among the glow worms and their relatives, such as *Zarhipis* and *Phengodes*. Here the females are not only wingless but larviform and luminous. In the related Drilinae, a non-luminous group, the males are also winged and the females wingless, while in a Bornean Lycid, *Duliticola paradoxa* Mjöberg,<sup>1</sup> recently described, the winged male is a pygmy as compared with his giant larviform mate. In other families we find similar, though not such extreme, conditions. This is especially true as regards the arid and semi-arid parts of the world. In our own arid west we have numerous

<sup>1</sup> The mystery of the so-called "Trilobite Larvae" definitely solved, by Eric Mjöberg, *Psyche*, Vol. 32, No. 3 (June, 1925), pp. 119-158.

cases where the males are fully winged and active and the females are fully winged and somewhat sluggish. Among the Scarabaeidæ, we have the well-known *Plecoma*; in the Elateridæ, *Euthysanius*, *Octinodes* and *Aplastus*; in the Dascyllidæ, *Anorus*; and in the Meloidæ, *Gynacomeloe*. *Piodes coriacea* Lec., one of the Cerambycidæ, shows a great difference between the sexes, the male having fully developed elytra and wings and the female having the elytra and wings much reduced. In the forested areas, we have a few Cerambycidæ and Chrysomelidæ with winged males and wingless females. Then there are a host of beetles where the first steps of sexual divergence as regards the wings have taken place, the males being of moderate size and active and the females large and sluggish. Such are many Lucanidæ, Scarabæidæ Elateridæ, Cerambycidæ and Chrysomelidæ. Of those cases where the males are wingless and the females winged, I can mention only a few, such as the South American *Psalidognathus buckleyi* Waterhouse, one of the Prioninæ in the family Cerambycidæ and several specimens of the Holarctic genus of Scolytidæ, *Anisonandrus*, which includes several of our common orchard ambrosia beetles or shot-hole borers.

In the Coleoptera there are also other agencies which assist in bringing the sexes together, but whether they are better developed in one sex than the other, I cannot say. Such is the power of stridulation found in many of the Carabidæ like the Cychrini, in the Hydrophilidæ, where it is marked in the genus *Berosus*, and in great numbers of the Cerambycidæ. Other beetles like the death watches among the Ptinidæ signal to their mates by tapping. Still others attract by means of odors. We need but mention the genus *Osmoderma* among the Scarabæidæ and *Aromia moschata* L., the musk beetle of Europe, one of the Cerambycidæ. Many other beetles give off peculiar odors which are evident even to our dull senses, such as those from the Carabidæ, Coccinellidæ, Chrysomelidæ and Tenebrionidæ. In fact it is, no doubt, through the sense of smell that most beetles find their mates and the probabilities are that it is the female which gives off the greater or the more distinctive odor. In some, the volatile matter is given off in an explosive manner, producing a crepitation. Such is the case in the Carabidæ among the Brachini or bombardier beetles, with *Metrius contractus* Esch. and so forth, as well as in the Paussidæ. The offensive gas is here used for offensive purposes, but I am convinced that the sound as well as the odor is of value for assembling purposes for the insects which have this power are all more or less gregarious. In fact, I believe, that as regards the sounds, odors and light produced by insects, especially Coleoptera, they are of value in the main for assembling purposes, for bringing the clan together, and that after this is accomplished the selection of mates occurs. The ability to produce light is found only within the Lampyrinæ among the Cantharidæ and in the genera *Pyro-*



*phorus* and *Melanactes* of the Elateridæ as far as I know. In the true glow worms and genera like *Phengodes* and *Zarhipis*, the light production is limited to the females. In the so-called fire flies, including the genus *Pyrophorus*, both sexes have the power and to about an equal degree. The light organs in the Lampyrinæ are located in the posterior abdominal segments or in the membranous area between the segments and in *Pyrophorus* near the posterior angles of the prothorax and on the underside of the body between the pro- and meso-thorax.

Besides the features mentioned above, there are to be found in various groups of Coleoptera certain peculiar modifications restricted to the males which must be of value to them for some sexual purpose. The exact function of these structures is at present unknown to us. They are often quite complex and interesting, as well as of great value to the systematist. Such are the peculiar excavations, generally margined with hair, found in the margins near the hind angles of the prothorax of the various species of *Silis*, one of the genera of the Cantharinæ. These differ in appearance with each species. Tho modifications at the apices of the elytra in the males of many *Malachi* and their relatives among the *Melyridæ* and in numbers of *Pedilus* of the family Pedilidæ, also, no doubt, have a value that is more important than that of mere ornamentation. In the males of a number of Scolytidæ there is a circle of long hairs on the front of the head; in many Carabidæ like certain *Amara*, there is a collection of small pits on the prosternum of the male; and in the Coccinellidæ there is a ventral tubercle in the male of *Scymnus marginicollis* Lec. and deep pits on either side of the last ventral segment of the males of *Rodatus*, a genus separated from *Rizobius* because of this character. These structures must be of sensory nature and of some value to the males during courtship.

## II. Characters of assistance in mating.

At first thought one would suppose that there would be but a limited number of structures outside of the sexual organs themselves, of value to the beetle during the act of mating. There are, however, many of these and they are to be found on most parts of the body. On the head it may be the mandibles, antennæ or palpi which are so modified that they are of value during this time. The sickle-like male mandibles in *Zarhipis* and *Phengodes* among the Cantharidæ as well as those of *Cebrio* and *Scaptolenus* among the Cebriionidæ are, no doubt, used to grasp the female just as they are in the Hymenopterous Mutillidæ. They have no value otherwise for the adult males take no food, I think. I am also inclined to believe that the mandibles of some of the more active Staphylinidæ, like certain of the genus *Philonthus*, where the heads and mandibles are much more developed in the males than they are in the females, might be useful in a similar manner. As regards the antennæ, we find the best examples for grasping purposes among

the genus *Meloe* of the Meloidæ and in *Collops* of the Melyridæ. In the first, three of the intermediate joints of the male antennæ of a certain portion of the species are so enlarged, flattened and twisted that they can readily grasp the antennæ of the female. In the male *Collops*, it is the basal joints that are modified, much in the same manner as in *Meloe*. Another interesting case that I know of is found in certain Bornean Psephenidæ where the terminal antennal joints are enlarged and so excavated beneath that they can fit over and enclose to a great degree the terminal joints of the female. There is only one case that I know of where the palpi are used as clasping organs, though they are often very much enlarged and modified in the males. That case is in the genus *Sphalera*, one of the Melandryidæ, and listed by Doctor Horn<sup>2</sup> who states that the palpi have an articulated appendage near the tip which probably serves as a grasping organ.

The modifications of the thorax are practically restricted to the legs and elytra unless we accept a greater roughness of the female pronotum as being of value. Of the legs, any pair may be modified. On the fore legs, the tarsi are the most subject to change. The commonest modification is through the expansion of the basal joints in the males and the development beneath of a complicated series of sucking disks and adhesive hairs so that the tarsi are enabled to grasp with ease the smooth dorsal surface of the female. These modifications are fairly common and well known to all entomologists so I need mention only a few of the cases. Dilated male tarsi are found with but few exceptions throughout the *Adephaga*, among many Silphidæ and Staphylinidæ, some Hydrophilidæ and Nitidulidæ, a few Tenebrionidæ, Chrysomelidæ, Rhynchophora, and so forth. In other groups the enlarged tarsal claws take the place of the tarsal pads, this being most evident among the Lucanidæ and Scarabæidæ. In a moderate number of cases the middle tarsi may be dilated and padded as well as the anterior, though generally to a lesser degree. The tibiæ may also be variously modified. In the males the front tibiæ are most commonly modified by being lengthened and bowed, or provided with series of fine serrations beneath, such conditions being observable in many Cerambycidæ, Scarabæidæ and Rhynchophora. In some of the Buprestidæ as in the *trinervia* group of *Chrysobothris*, the anterior tibia may be suddenly dilated near the apex while in a number of the typical genus *Buprestis*, the anterior tibiæ of the males are internally emarginate and armed with a reflexed tooth at apex. In other beetles there is a distinct tuft of hair on the inner side near the apex. A species of *Aphodius*, one of the dung beetles, is provided with a peculiar clavate appendage to the inner side of the fore tibiæ near the tip. Among the Meloidæ, certain Chinese *Epicauta* have a hook-like process near the fore tibiæ. In

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<sup>2</sup> Secondary sexual characters in *Collops*, *Meloe*, etc., by George H. Horn, Bul. Brookl. Ent. Soc., Vol. 7 (1884), p. 93 (Proc.).



fact, such peculiar modifications are really quite numerous and one could gather together a goodly array if he wished to devote the time to it. The middle tibiae are most commonly modified by being provided with tufts of hair on the inner face. Among certain members of the genus *Dicerca* of the Buprestidae there is a large spine on the inner side of the tibiae and in some species of *Lebia* of the Carabidae, there is a notch at the inner side near the tip. In regard to the posterior tibiae, some of the most marked modifications are in the way of the greater bowing of the organ, seen in certain *Necrophorus* among the Silphidae, and the great lengthening as well as bowing accompanied by an excessive enlargement of the posterior femora, especially evident in the beautiful Mexican genus *Chrysina* of the Scarabaeidae. In many of our burrowing Carabidae, we find a great development of the hind thighs in the male, accompanied by an excessive enlargement of the trochanter. It is very evident in *Patrobus californicus* Mots. and in one of the groups of *Pterostichus*, such species as *grandiceps* Lec. and *caligans* Horn showing it very plainly. The divergent modifications of the elytra of value for mating purposes are, as might be expected, limited to the female. In the main they consist of a greater punctation or roughening of the surface and are to be found very commonly among the Dytiscidae and to a lesser degree in the Carabidae, Lucanidae, Scarabaeidae, and Elateridae. In some of the Dytiscidae there is also a distinct grooving, seen best in many species of the genera *Dytiscus* and *Acilius*.

The abdominal changes are most marked in the male and consist of such features as an additional segment, very evident in the Coccinellidae where the male has six and the female five segments; a grooving or sulcating of the mid portion of the anterior segments, quite marked in many Buprestidae; a flattening or grooving of the posterior segments, best marked and very commonly observed in the Buprestidae, Elateridae, Cerambycidae and Chrysomelidae; and a truncating or notching of the apex of the last segment, a very common character in a goodly proportion of the Coleoptera. In some Cerambycidae as well as in other families, there is also produced a peculiar tuft of hairs near the last segment. In *Acmaeodera guttifera* Lec., one of the Buprestidae, the hair covering the entire abdomen is long and curled in contrast to the shorter and straight hair of the female.

### III. Characters which may be of possible value to the males in combat.

The characters which are generally believed to have been developed as a result of the combative tendencies of the males are the mandibles and as a result of the enlargement of these a supplementary development of the head and prothorax. In the families where this condition is to be found are the Heteroceridae, Lucanidae, Brenthidae, Anthribidae, and the Prioninae of the Cerambycidae. The males of the Anthribidae and Cerambycidae are

notoriously pugnacious. All collectors who have had the misfortune to rear a number of males of some desirable species of the latter and had them emerge at the same time have noted this to their sorrow in the maimed condition of their specimens. It has been surmised by some that certain of the Scarabæidæ, which have greatly developed horns on the head or prothorax of the males, also used these in combat, but most observers question this. Under this category should also be noted the fact that many Staphylinidæ like certain species of *Philonthus* as previously stated, some Nitidulidæ, at least one species of *Pristoscælis* among the Melyridæ, and so forth, have males with much larger mandibles and fore bodies than their mates. Whether these are developed as a result of combative tendencies is, of course, a question. In fact, in regard to this whole subject there is a need for some very careful observing.

IV. *Characters which are hypertrophic or merely ornamental.*

Of hypertrophic characters which are sex limited, there are a great number among the Coleoptera. Some of these we have already accounted for as being of some definite use to their owners. There are others, however, for which we cannot find a use and which we are inclined to consider as but excessive growths, mere ornaments, like the peacock's tail and man's beard. Such growths are the long horns to be found on the heads of many Scarabæidæ like *Dynastes*, *Bolboceras*, *Copris*, certain Cetoninæ, and so forth, also *Sinodendron* of the Lucanidæ and many Tenebrionidæ. The thoracic developments seem to be in the main restricted to the same families as the above. Notable cases among the Scarabæidæ are the prominent horns of *Dynastes*, *Golofa*, *Copris* and *Phanaeus*. In the Tenebrionidæ the best known case in our fauna is that of *Bolitotherus cornutus* Panz. It is more common among exotic forms. Other characters which are of an ornamental nature are differences in color and color pattern. These are to be found in most of the families. The following list: Carabidæ, Dytiscidæ, Coccinellidæ, Elateridæ, Buprestidæ, Scarabæidæ, Cerambycidæ, Chrysomelidæ, and Rhynchophora will give one an idea of the range. Peculiar tufts of hair, sometimes seen ornamenting certain male Cerambycidæ may, perhaps, belong under this category, though I am inclined to believe that in most cases they have some sensory function and as such are of definite sexual use. Many of the differences in color can also be explained as being more than merely ornamental. Such are the cases where the females are more sombre in color than their mates. Here they have a protective function in that they enable them to blend better with their surroundings, particularly at the critical egg-laying period.

V. *Characters which are of value to the female during oviposition.*

The most notable of the divergent characters which are of assistance to the female during this period is the increased length



of the rostrum or beak, to be observed among the Brenthidæ and most of the Curculionidæ, excluding the Otiorrhynchinæ. The longer beak, of course, enables her to bore more deeply and thus place her eggs in a safe retreat or near suitable food for the forthcoming larvæ. In the tribe *Graphisurus* of the Cerambycidæ, the females have the terminal abdominal segment narrowed and greatly lengthened so that it can be used as a rigid ovipositor and thus assist her in placing her eggs in a proper location. Among many beetles which deposit their eggs in the ground or in rotten wood, the forelegs of the females are more powerfully developed than they are in the males. Such cases are quite numerous among the Lucanidæ and Scarabæidæ and fairly frequent among the Elateridæ and Tenebrionidæ. Color is also, no doubt, of great aid to many females, as stated previously, in enabling them to perform this function without unduly attracting attention. In most cases they share their protective coloration with their mates but there are numerous instances where the males are quite ornate and the females sombre. Such are some of the Buprestidæ, a few Cerambycidæ, and so forth. In the cases of most of the Cerambycidæ where there is sexual dichromatism, I have not been able to see that the females were benefited by the coloring. In many cases she is more conspicuous than her mate as in the case of our common California *Leptura latifica* Lec. where she has her elytra a brilliant crimson and he is either entirely black or with but few yellow markings.

VI. *Characters which are of value to the sexes while performing their household duties.*

Inasmuch as there are but very few Coleoptera which work together in the matter of preparing for the welfare of their progeny, we naturally expect to find but a limited number of cases which can be cited under the above heading. The best known is that of the Scolytidæ or engraver beetles, both sexes of which take part in excavating or looking after the burrow. The females generally do most of the tunnelling and are well fitted for their duties with compact cylindrical bodies, short and powerful legs with the tibiæ outwardly serrate so as to get a good purchase, and large heads and strong mandibles. The apices of the elytra are normally evenly rounded. The males are much like their mates in general body structure but are usually somewhat smaller. They often have the apices of the elytra excavated, armed with tubercles or spines, or even squarely truncate, and in some the front of the head is also excavated and the pronotum more tuberculate than in the female. Odd though these structures seem, we can see that they have a good use when we realize that while the female does the burrowing, the male does most of the work of removing the excavated material and may work either backward or forward, a double-ended animated shovel. The male, when not so occupied, is generally near the entrance to the burrow, blocking the orifice

with his body against all intruders, rivals, as well as enemies of other types, the apical elytral modifications serving an admirable purpose. In many of the Bostrichidæ, one of the families of powder post beetles and a group widely separated systematically from the preceding but, like them, wood-boring in the adult state as well as the larval, we also find many similar types of modifications. Here the most marked structures are the greatly developed pronotal horns in the males as well as the larger spines or elevations on the elytral declivity. No doubt these serve the same useful purpose as in the Scolytidæ. We, however, know less of the domestic life of these beetles than we do of the others. In the Attelabidæ, the leaf-rolling weevils, a group where the female performs her task alone, yet exercises a good deal of energy and mechanical ingenuity in cutting out and rolling up portions of a leaf into a cylinder to serve as food for their young, there are generally to be found marked differences in the sexes. The females as a rule have their heads more generally prolonged, the part elongated, whether the base of the head or the front, varying with the species and genus, and the legs likewise more elongated. These sexual modifications naturally aid the females in their work. The male modifications of various types, such as rows of tubercles along the ventral segments of the abdomen, shorter and stouter legs, the dentate front femora and so forth, are probably only of use in mating. In the Scarabæini, which includes the well-known sacred *Scarabæus*, great attention is given to the collecting and storing of food. The hind legs are especially modified for this purpose, the tibiæ elongated and bowed, but this seems to be common to both sexes. The female does the greater part of the work but the male often assists. The work is, therefore, of a common type so there is less sexual divergence than usual.

The subject which I have just discussed is a big one. As a result I could give but a limited number of the cases as compared with what there actually are and not describe them with the minuteness which they merit. I trust, however, that I have given enough to enable one to realize how important is the subject and how diverse are the ways in which the individual sexes have met their needs. Unfortunately, but little detailed study has been given to it. It is to be hoped that some day it will attract careful workers with the result that we will have painstaking observations in the field, combined with detailed microscopical studies. Then, perhaps, we shall be informed of the true significance of these characters and thus be able to realize even more than we do now how wonderful is insect life.

After considerable discussion of the paper and other matters, the meeting adjourned.

F. E. BLAISDELL, Secretary.



## ONE HUNDREDTH AND THIRD MEETING

The one hundredth and third meeting of the Society was held in the Board Room of the Mechanics Institute Library, 51 Post Street, Saturday evening, February 27, 1926. President Van Dyke in the chair. In the absence of the secretary, Mr. Van Duzee was asked to serve as secretary *pro tempore* for the meeting.

The following is the list of attendance: E. C. Van Dyke, E. R. Leach, Charles L. Fox, Eric Walther, J. O. Martin, E. P. Van Duzee, Ralph Barrett. Mr. M. C. Van Duzee of Buffalo, New York, was a visitor.

Doctor Van Dyke announced that Dr. F. E. Blaisdell had handed him his resignation as secretary-treasurer of the Pacific Coast Entomological Society and as treasurer of the Pan-Pacific Entomologist, the former to take effect at the annual meeting in August, 1926, and the latter to take effect July 1, 1926, and he suggested that the Society hold a meeting with a dinner at some suitable restaurant about the last of April, in honor of Doctor Blaisdell's long service in the Society. This suggestion met with the full approval of the members present and the chair appointed Mr. E. R. Leach, chairman, and Mr. C. L. Fox as a committee to make arrangements for such a dinner.

Doctor Van Dyke suggested that in the future the meetings of the Society be held on some regular date each quarter, and appointed Mr. J. O. Martin, with Prof. E. O. Essig and Prof. R. W. Doane consulting members of the committee, to select a date for the meetings, and to present the matter before the next meeting of the Society for action.

Doctor Van Dyke then stated that the order of the evening was a consideration of the entomological museums of this country and Europe. Professor Essig had prepared a full report on these museums in this country, extracts from which were read by the chairman, after which he read his own report of the entomological museums of Europe.

The chair then called upon Millard C. Van Duzee for some remarks on the Diptera collections in the eastern museums. In response Mr. Van Duzee spoke of the Coquillett, Townsend, Aldrich, McAtee and Malloch collections at the National Museum at Washington; the Osten-Sacken, Loew and Banks collections at the Museum of Comparative Zoology at Cambridge, Massachusetts; the collections of Wheeler, Melander and Brues at the American Museum of Natural History at New York; the Johnson collection at the Boston Society of Natural History; the Snow and Aldrich material at the University of Kansas at Lawrence, Kansas; the Johannsen material at Cornell University, and the Cresson material at the Academy of Natural Sciences at Philadelphia.

The chair then called upon E. P. Van Duzee for some account of the Hemiptera in the entomological museums of the country. He gave a short account of a few such collections, notably the

Harris collection at the Boston Society of Natural History, the Fitch types at the New York State Museum, the Uhler collection at the National Museum, the Heideman collection at Cornell University, the Snow material at the University of Kansas and the Hemiptera at the California Academy of Sciences.

Mr. E. R. Leach followed with remarks on the Lucanid collections in Europe, especially those of Paris, and Mr. C. L. Fox spoke on the Hymenoptera at the U. S. National Museum, the University of Nebraska and Cornell University.

After discussion the meeting adjourned.

E. P. VAN DUZEE, Secretary pro tempore.



## ONE HUNDREDTH AND FOURTH MEETING

The one hundredth and fourth meeting of the Society was held on Saturday evening, May 1, 1926, as a special meeting in honor of Dr. F. E. Blaisdell, retiring secretary, at the Pig'n Whistle, Market Street, San Francisco.

The following members and visitors attended:

E. C. Van Dyke, F. W. Nunenmacher, William F. Breeze, Mrs. William F. Breeze, Charles L. Fox, J. O. Martin, E. R. Leach, E. P. Van Duzee, E. O. Essig, Isabel McCracken, J. F. Killeen, Mrs. J. F. Killeen, Mrs. F. E. Blaisdell, Mrs. E. P. Van Duzee, Grant Wallace, Mrs. Grant Wallace, Miss Helen Sanford, Miss Louise Ophuls, Lawrence Bruner and daughter, Mrs. E. C. Van Dyke, M. C. Van Duzee, Theressa Nunenmacher, and Paul Vansell.

After dinner had been served, the different members were called upon by President Van Dyke for remarks. Doctor Blaisdell told of how he became interested in entomology and spoke of his work in the interests of the Society; of the several vicissitudes that the Society had passed through during the twenty-five years of its existence. He remarked that it was his desire to have the Society continue publishing its proceedings in the future as it had done in the past. That several communications had been received concerning the interesting data contained in the reports of the meetings. That he had always endeavored to keep distant members interested in the Society by sending all notices concerning the activities of the Society; that the Society had gradually taken its place among the more important Societies of the United States.

After social discussion the several members dispersed.

F. E. BLAISDELL, Secretary.







